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Teacher Job Satisfaction, Student Achievement and the Cost of Primary Education

- Evidence from Francophone Sub-Saharan Africa -

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Abstract

Low teacher motivation and its detrimental effect on student achievement are central problems of many education systems in Africa. Using standardized data for student achievement in Burkina Faso, Cameroon, Côte d'Ivoire, Madagascar and Senegal, this paper analyzes the empirical links between various policy measures, teacher job satisfaction and primary education outcomes. It appears that there is only very limited evidence for the effectiveness of intensively debated and costly measures such as reducing class size, increasing academic qualification requirements, and increasing teachers salaries. Other, simpler measures such as an increased provision of textbooks are both more effective and less costly.

It also appears that teacher job satisfaction and education quality are not necessarily complementary objectives. Especially those measures ensuring control and incentive related working conditions for teachers, significantly increase student achievement while reducing teacher job satisfaction. In addition, teachers' academic qualification beyond the "baccalauréat", while beneficial for students' learning, tends to lead to a mismatch between teachers' expectations and professional realities, and thereby reduces teachers' job satisfaction.

JEL classification: I21, O15, O20

Keywords: teacher job satisfaction, student achievement, Africa

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1. Introduction

The role of teachers is crucial for the transfer of knowledge in schools. At the same time, teachers' remuneration is the biggest cost factor in educational finance. In most countries, developing and industrialized alike, teachers' salaries account for between half and three fourth of current education expenditure. In some African countries, their part rises up to 90% (World Bank 2003). Given the magnitude of the financial investment involved, it is extremely important to know whether these funds are used efficiently.

In Africa, a major political topic in this context is how to resolve the problem of low teacher motivation and its detrimental effect on student achievement. In several countries, recent attempts to reduce cost through the engagement of teachers on non-civil servant contracts ("voluntary teachers") as well as generally declining salaries have provoked heavy protests of teachers' unions. The literature is full of apparently obvious policy recommendations, in particular the raising of teachers' salaries and reductions in class size (see e.g. UNICEF 1999, p. 39, AfDB 1998, p. 197, Maclure 1997, p. 52, N'guilé 2000, Chivore 1988). This corresponds to what teachers themselves claim to be responsible for their demotivation, not only in developing countries, but in general (Spear, Gould and Lee 2000). However, in-depth analysis for developing countries is rare and generally concentrates on the aspect of job satisfaction alone. The link to education quality has been difficult to establish so far, since there were no suitable data on student achievement until the late 1990s.

Another, more recent strand of the literature does not consider teacher job satisfaction as an objective in itself. It is concerned with incentives for quality education whereby the teacher is merely seen as an instrument. Finally, there is a rapidly growing literature on determinants of student achievement, mainly based on the estimation of education production functions. However, the aspect of teachers' job satisfaction is typically neglected in this context.

This paper intends to bridge the gap between the different strands of the literature. It attempts an initial empirical analysis for francophone, sub-Saharan Africa in which both aspects, teacher job satisfaction and the ultimate objective of educational quality, will be equally considered. The analysis will be based on the exceptionally rich database of the "Program of Analysis of Education Systems" (PASEC) managed under the authority of the conference of francophone education ministers (CONFEMEN).¹

Three questions will be addressed:

¹ Original French names: PASEC: Programme d'Analyse des Systèmes Educatifs des Pays de la CONFEMEN; CONFEMEN: Conférence des Ministres de l'Éducation des Pays ayant le Français en Partage. Data and first analytical reports are available on CD-Rom from the CONFEMEN (CONFEMEN 1999). If interested please contact the managing team at pasec@sentoo.sn.

- What are the factors determining teachers' job satisfaction?
- How does teachers' job satisfaction translate into learning outcomes?
- Which cost efficient measures could be suggested in order to simultaneously increase both teachers' job satisfaction and education quality?

The paper is structured as follows: Section 2 provides a more detailed review of the literature on teacher job satisfaction and incentives. Section 3 discusses the PASEC dataset and its suitability for the analysis of teachers' motivation and education quality. Section 4 describes the actual state of teachers' job satisfaction based on different sources and variables. Sections 5 to 7 econometrically address the three analytical questions raised above, and section 8 presents the conclusions.

2. An overview of existing literature

This study draws from earlier work in various disciplines: educational science and pedagogy, organizational theory, and economics. Unfortunately, these different strands of the literature have so far developed in a rather disconnected manner.

For several reasons, teacher job satisfaction has always been an important issue in empirical pedagogical research: First, job satisfaction is considered to have an effect on the quality of teaching and on the school achievement of pupils (e.g. Somech and Drach-Zahavy 2000; Nabi 1995; Menlo and Poppleton 1990). Second, it has been found to predict withdrawal cognition (Lam, Foong and Moo 1995; Hall, Pearson and Carroll 1992), and may therefore be seen as an important aspect in maintaining the stability of the teaching staff. And third, teacher job satisfaction is supposed to contribute to the quality of teacher work-life, making their professional experience an element of psychological health (Menlo and Poppleton 1990), personal fulfillment and growth. This might be perceived as an objective in itself (Garrett 1999).

While teacher job satisfaction in general has attracted a broad range of pedagogical research, only little attention has been paid to teacher job satisfaction in developing countries. However, it seems clear that teacher job satisfaction in developing countries might be influenced by factors that are different from those affecting teacher job satisfaction in the North, where most of the teacher job satisfaction research has been carried out. For instance, questions of basic educational infrastructure or teacher salaries could play a higher role in countries where education may happen under a tree, and where many teachers can hardly afford their living and may need second and third jobs to cover the basic needs of their families. Indeed, existing literature on teacher job satisfaction in developing countries, and specifically in Africa, generally suggests a stronger emphasis on monetary aspects and, perhaps more surprisingly, on teacher

family surroundings (see e.g. Chivore 1988 for Zambia, Abangma 1981 for the Anglophone part of Cameroon, Banya and Elu 1997 for Sierra Leone, and Postlethwaite 1998 for Tanzania, Zambia and Uganda). It should be noted that most of this literature analyzes teachers' own perceptions about the factors relevant for their (de)motivation. Results are thus subjective, may change over time and with circumstances, and do not necessarily imply that teachers working under 'improved' conditions according to some objective measure of these criteria, are indeed more motivated on their job. This problem does not arise when working with separate indicators of job satisfaction on the one hand, and teaching conditions on the other hand, as we will do in our study.

The more theoretical part of the literature by educational scientists draws from the general concepts of motivation and job satisfaction typically developed in the context of the theory of organization. Apart from Maslow's (1954) well known hierarchy of needs which, in our context, also stresses the relevance of a separate analysis of teacher job satisfaction for developing countries, the most common basis of theoretical analysis is Herzberg's (1968) famous two-factor model and extensions thereof. However, no consensus has yet been found, and the literature does not offer a uniform theoretical concept of job satisfaction so far (see e.g. Evans 1997, for discussion).

Moreover, the general concepts of job satisfaction have been questioned in terms of their applicability to the field of teacher work (e.g. Nias 1981, Evans 1997). Following Barnabé and Burns (1994), teaching differs from other professions regarding several aspects: the job is mostly carried out isolated from other adults, and teachers are also isolated when preparing lessons. So, teachers might be different from other workforce because they spend most of their time either working alone or together with pupils. Wittmann (2002) and Garrett (1999) provide interesting literature reviews of job satisfaction and motivation theory with respect to teachers and schools.

While drawing from this literature, in our own study, the definition of job satisfaction used will be very pragmatic and based on the data at hand. It will simply indicate whether the teachers do or do not like their job. No specific distinction is made between satisfaction and dissatisfaction as models such as Herzberg's (1968) two-factor analysis would suggest. Moreover, when we talk about motivation, we simply mean the transformation of job satisfaction into effort at work.

Almost totally separate from the literature reviewed so far, but driven by recent political developments in many countries, economists have shown a growing interest in the issue of how incentives could be generated for better teaching. Interestingly, while the pedagogical literature is largely teacher centered, often taking the positive relationship between teacher job satisfaction and improved education quality simply for

granted, the economic literature is largely student centered without any consideration of the needs of the teachers as such. While teacher attitudes are considered important, they are merely seen as an instrument, and not as an objective in its own right. Again, the bulk of the literature considers education in the North, notably in the United States. However, there are some exceptions such as Chaudhury et al. (2006), Duflo and Hanna (2005), Banerjee and Duflo (2006), and Bourdon, Frölich and Michaelowa (2006). Reinikka and Svensson (2003) and Francken, Minten and Swinnen (2005) consider related questions of transparency and community monitoring in Uganda and Madagascar, but with a focus on the general administration rather than on teachers. Reviewing the general literature on incentives in education systems, Wößmann (2006) attempts to draw lessons for the specific case of developing countries.

The literature typically covers one or more of the following aspects of possible incentive systems: general control systems, community monitoring, contract conditions, performance based (or simply presence based) salaries, school choice and standardized exams as a monitoring tool. It also attempts to establish the relative efficiency of different of these measures, either theoretically (see e.g. Jaag 2005) or empirically and in terms of practical implementation constraints (Banerjee and Duflo 2005). Glewwe and Kremer (2006) provide a useful overview of the specific literature for developing countries.

As our study intends to directly empirically relate teacher job satisfaction and its determinants to education quality measured by student achievement, it is also related to the large research on education production functions which econometrically searches for effective learning inputs. For Africa, examples of studies covering several countries are Michaelowa (2001a), Lee, Zuze and Ross (2005), and Michaelowa and Wechtler (2006). Moreover, interesting studies partially based on experiments have been carried out by Glewwe et al. (2004) and Glewwe, Kremer and Moulin (2000) in Kenya, as well as by Glewwe and Jacoby (1994) in Ghana. The outcomes of this literature will help us to select the relevant variables for our final empirical model.

3. The PASEC dataset

In order to bring together these different strands of the literature in an empirical analysis of teacher job satisfaction and student achievement, and in order to finally determine the joint determinants of both objectives, our analysis requires a rich dataset with information on education quality (measured directly in terms of learning achievement) as well as background information on students, teachers and schools. To draw conclusions about job satisfaction, detailed information on teachers is particularly relevant. The PASEC dataset does fulfill these requirements. Data are derived from a

stratified random sample of classrooms at different grade levels of primary education in several sub-Saharan African countries. In order to maximize the available number of observations, this study jointly uses the data for Burkina Faso, Cameroon, Côte d'Ivoire, Madagascar and Senegal for which internationally comparable information is available. Between 1995 and 1998 standardized tests in math and French were administered in primary schools of all five countries together with a collection of information on the students' socio-economic background and school variables that were collected using both teacher and director questionnaires. Concerning Cameroon, it should be noted that the country runs two parallel education systems, one in English and one in French. Only the francophone system is considered here.

Among the datasets providing internationally comparable data on student achievement and background variables PASEC has the advantage that it systematically includes pre-tests at the beginning of the academic year. This is not the case for the few other standardized surveys for developing countries, and not even for the most well-known international surveys mainly covering industrialized countries such as TIMSS or PISA.² However, only the correction for results at pre-tests allows for a precise acknowledgement of learning within a specific year. Since teachers often change from one year to the next, this is crucial for the outcome oriented evaluation of all teacher related variables - including job satisfaction.

Since there is strong evidence that the effects of various variables on student learning is not independent of the class level considered (Bernard 1999), information of different grades should not be pooled. To simplify the analysis, this study focuses on a single grade level. While the full dataset is available for both second and fifth grade students and teachers, only information concerning the fifth grade was included into this analysis. This is the last grade of primary education in Madagascar, and the second highest grade in the other four countries covered by the sample. For this grade level, the PASEC database contains information on learning achievement for between 2000 and 2500 children in about 100 primary schools in each of the five countries. The items selected for the tests were discussed among education specialists and members of the different education ministries in order to equally reflect the curricula in all countries. For all tests Cronbach's alpha, the numerical coefficient of reliability, is between 78%

² Similar surveys in the developing world were initiated for a couple of English speaking sub-Saharan African countries by the Southern Africa Consortium for Monitoring Educational Quality (SACMEQ) and for Latin-American countries by the "Laboratory Project" of UNESCO-Santiago. For an overview and initial results see Ross (1998) and UNESCO-Santiago (1998) respectively. For information on TIMSS and PISA see IEA (2001), OECD (2001) and OECD/UNESCO-UIS (2003).

and 84%. This shows a good inter-item consistency and a high probability that carrying out the same test again would lead to very similar results.³

One shortcoming of the PASEC dataset is, however, the high number of missing values for a considerable number of variables both at student and at school level. In many regressions, this problem reduces the number of observations to 60%-70% of the total number of students and schools in the sample. Unfortunately, the problem is particularly strong for some of the teacher variables most relevant here. A second factor limiting the suitability of the dataset for the analysis of teachers' job satisfaction is that no information is available on individual teachers' salaries, which are often expected to be one of the important extrinsic determinants.

4. Evidence on teachers' job satisfaction

Before entering into the actual analysis, it appears useful to gain an impression of how satisfied teachers actually are about their work in the countries considered here. As mentioned above, our definition of job satisfaction is rather simple and supposed to indicate whether teachers do or do not like their job. In our data, the most important indication is given by the teachers' own answers to the question which profession they would choose if they had to choose once again. Teachers had to opt for either the medical, the judicial, the agricultural, the technical, the financial, the commercial, or again the teaching profession. Regrouping the answers, a binary variable (JOBSATIS) can be created indicating whether the teacher would choose his or her profession again (JOBSATIS=1), or whether he or she would not (JOBSATIS=0).

Two other variables can be used to complement and countercheck the relevance of this variable. The first is teachers' desire to change the school if they had the occasion to do so. Their answer is again captured by a binary variable (CHANGE) that takes the value 1 if they would like to change the school, and the value 0 if they would not. The second variable captures the number of working days teachers were absent during the month before the survey (ABSENCE). Unfortunately, just as for the other two variables, the information is collected only by self-reporting, which probably leads to some understatement whenever respondents do not trust the anonymity of the questionnaire. The fear to reveal the truth also appears to have resulted in a high number of missing values for this particular variable. Moreover, teachers apparently did not always understand the question, since some figures exceed the maximum number of working days in a month. In these cases, the value of the variable was adjusted to ABSENCE=25 for the purpose of this study.

³ A detailed description of the data is provided by CONFEMEN (1999).

Assuming that, on average, teachers satisfied with their work would (i) choose their profession again, (ii) be happy to stay in the same school, and (iii) will be absent less often than other teachers, Table 1 provides an overall impression of teacher job satisfaction for the five countries in the sample.

Overall, more than 50% of fifth grade teachers seem to prefer teaching to any other profession, and over 40% like their schools and do not want to change. The situation therefore does not correspond to the desperate picture of a generally demoralized teaching profession suggested by many African sources (for an overview, see Maclure 1997, ch. 4). At the same time, as almost half of the teachers would prefer another job, and almost 60% would like to change schools, there is definitely much room for improvement.

Table 1: Indicators of teacher job satisfaction in francophone Africa, 1995-1998

| | Burkina Faso | Cameroon | Côte d'Ivoire | Madagascar | Senegal | Total |
|---|----------------|----------------|----------------|----------------|----------------|----------------|
| Share of teachers who would choose the same profession again (JOBSATIS=1), in % | 56.7 (4.9) | 55.8 (5.1) | 45.8 (4.6) | 65.5 (4.4) | 40.6 (5.0) | 53.2 (4.8) |
| Share of teachers who would like to change schools (CHANGE=1), in % | 43.3 (4.9) | 38.9 (5.0) | 54.2 (4.6) | 23.5 (3.9) | 61.5 (5.0) | 43.8 (4.7) |
| Teachers' average absence (ABSENCE), in working days/month | 2.24 (0.38) | 1.80 (0.39) | 1.28 (0.16) | 2.50 (0.42) | 4.72 (0.54) | 2.39 (0.38) |

Note: Standard errors in parentheses.

Moreover, absenteeism appears to be a serious problem. PASEC data indicate that teachers, on average, miss their classes for about half a week per month. Assuming that teachers understate rather than overstate their absence, and that they tend to deny reporting when their absenteeism is particularly pronounced, the true situation can be presumed to be even worse.

However, Table 1 also shows that there are significant differences between individual countries. The situation is clearly the worst in Senegal where the average teacher is absent about twice as often as in all other countries. The other indicators point in the same direction: more than 60% of teachers would like to change schools if they had the occasion, and only slightly above 40% would choose the teaching profession again. In both cases, the figure indicates a lower job satisfaction than in any other country, and significantly differs from the country average.

Côte d'Ivoire also shows a relatively low level of job satisfaction. While the share of teachers who would again choose the teaching profession is considerably

higher and the share of teachers willing to change schools is considerably lower than in Senegal, these differences are not significant at a level of 5%. Only with respect to its comparatively low absence rates does Côte d'Ivoire show a significantly better result than Senegal.

At the other end of the scale, there is Madagascar, with about average absence rates but an exceptionally strong preference for both teachers' current profession and institution. Over 65% would choose the same profession again, and only 23.5% would like to change schools. Burkina Faso and Cameroon are in between.

It is interesting to devote some attention to the relationship between the three indicators. The presentation of country means has already suggested a significant negative correlation between the preference for the teaching profession and the desire to change schools. If JOBSATIS correctly reflects teachers' general liking of their job, one should indeed expect them to also show a certain appreciation of their place of work. Similarly, if JOBSATIS is correctly specified, one should expect this variable to be negatively related to teachers' absence rates. However, the latter relationship is neither clear in the above country comparison, nor does it turn out to be significant when calculating the chi-square test based on the contingency table for these variables. Contingency coefficients are presented in Table 2. For this purpose, the variable ABSENCE was temporarily recoded into a discrete variable with three categories (0, 1-2, and 3 or more days of absence). Contingency coefficients appeared to be reasonably robust with respect to alternative classifications of the data.

Table 2: Bivariate contingency coefficients

| | JOBSATIS | CHANGE | ABSENCE |
|----------|----------|----------|---------|
| JOBSATIS | 1 | 0.172*** | 0.071 |
| CHANGE | 0.172*** | 1 | 0.111* |
| ABSENCE | 0.071 | 0.111* | 1 |

Note: ***significant at $\alpha=0.01$, *significant at $\alpha=0.10$.

One major reason for the missing link between ABSENCE and JOBSATIS might be that the relation between both variables is hidden through the influence of additional variables. It might also be the case that ABSENCE stands for a different dimension of job satisfaction and must therefore be considered as a fully complementary measure. Finally, it could be that the missing link between both variables is a consequence of (partly country specific) factors that are independent of the teachers' positive or negative feelings about their job. Concerning the variable CHANGE, to a certain extent, similar questions arise, even though the correlation with

JOBSATIS is highly significant. These questions will all be discussed in the next section that attempts to analyze the determinants of teacher job satisfaction.

5. Determinants of teacher job satisfaction

In order to derive the determinants of teacher job satisfaction, the three indicators presented above will be regressed on five groups of variables:

- Variables describing the classroom environment and school facilities (class size and structure, students' initial performance, availability of books, electricity, tables, blackboards and other equipment, proximity of the next city...)
- Variables describing the teachers own characteristics (gender, family status, job experience, qualification...)
- Variables describing the teacher's contract conditions (civil servant or private employee, job perspectives, additional work apart from teaching...)
- Variables describing the human relations, teacher's supervision and responsibilities (exchange with colleagues, meetings with the director, control by parents and school inspectors...)
- Country dummies to capture country-specific differences.

Finally, JOBSATIS will be considered as an explanatory variable for both CHANGE and ABSENCE so as to gain some further insight into the relationship between these variables.

Generally, the explanatory variables selected here reflect the relevant extrinsic and intrinsic predictors of teacher job satisfaction discussed in the literature, notably based on situational models of job satisfaction (see e.g. Hoy and Miskel 1996). It is expected that teacher job satisfaction will be enhanced by a well equipped school environment, adequate training, and contract conditions which ensure long-term job prospects, security and a decent salary. Moreover, teacher job satisfaction will probably benefit from a positive exchange with colleagues, the director and students' parents, but it might suffer from pressure via control. Other variables, such as teachers' family status and gender, are included as control variables.

5.1. Methodology

In order to test these hypotheses, a probit model will be estimated for the two binary dependent variables JOBSATIS and CHANGE. The probit model takes into account the specificities of discrete choice. It uses a non-linear regression approach because linear predictions would tend to be out range in many cases, and it considers some underlying

latent variable, e.g. some unobserved continuous variable reflecting the teacher's feelings about his or her job. Only when positive feelings exceed a certain threshold, the teacher will be ready to opt for the same profession again (or opt for staying in the same school).

For the variable ABSENCE, a tobit regression model is used so as to capture left censoring at 0 and right censoring at 25 (the minimum and the maximum of working days a teacher can be absent within a month). The tobit model combines the features of an ordinary regression for continuous dependent variables, and the features of binary choice models. The latter is necessary due to the censoring. We may again imagine an underlying continuous variable, in this case indicating a disposition for missing on the job. Within the month which is referred to in the teachers' response, this variable is observed between 1 and 25. However, the disposition can be extremely bad (>25) or extremely good (<0) and this will no more be reflected in the data observed. Thus beyond the two limits, we have to again deal with latent variables. This is precisely what the tobit model takes into account. See Greene (2003, Ch. 21 and 22.3) for further explanations for both probit and tobit models.

5.2. Results

Table 3 presents the results. For each dependent variable, two regressions are displayed. The first includes a high number of explanatory variables while the second is limited to those with the highest explanatory power. In this way, the table offers both a general insight into the range of variables tested and an overview of the optimal model. Detailed variable descriptions are provided in the appendix.

Classroom environment

Variables to capture the influence of the classroom environment include students' average knowledge level measured at the beginning of the school year (RATE1 and RATESN1⁴), class size (STUDNUMB), and specific aspects of organization such as several grade levels within a single class (MULTGRADE) and different classes using the same classroom at different times of the day – generally with the same teacher (DOUBLSHIFT). Classroom equipment is measured by an index combining very basic items such as a blackboard, chalk, benches, tables, etc. (BASEQUIP), the availability of textbooks for both math and French (BOOKS), of teacher guide books (GUIDE), and of electricity (ELECTR). It is also considered

⁴ For Senegal the separate variable RATESN1 had to be introduced since in this country, the pre-test differed from the standardized version of the other four countries.

Table 3: Determinants of teacher job satisfaction

| Dependent Variable: | JOBSATIS | | CHANGE | | ABSENCE | |
|--------------------------------------|---------------|---------------|---------------|---------------|----------------------------|----------------------------|
| Method: | ML-Probit | ML-Probit | ML-Probit | ML-Probit | ML-Tobit | ML-Tobit |
| N | 403 | 504 | 403 | 497 | 353 | 384 |
| Expl. Variables | Coef. Regr. 1 | Coef. Regr. 2 | Coef. Regr. 3 | Coef. Regr. 4 | Coef. Regr. 5 | Coef. Regr. 6 |
| <i>Classroom environment</i> | | | | | | |
| RATE1 | 0.3371 | | -1.3170 | -1.4602 ** | -3.3817 | |
| RATESN1 | 1.8411 | | 1.6571 | 1.9988 | -11.2712 | |
| STUDNUMB | -0.0065 * | -0.0059 ** | -0.0044 | -0.0044 | -0.0071 | |
| MULTGRAD | 0.1406 | | 0.2252 | | 2.5971 ** | 2.7065 *** |
| DOUBLESIFT | -0.1494 | | 0.1088 | | 0.3434 | 1.7682 * |
| BASEQUIP | -0.0006 | | 0.1821 | | -0.5981 | |
| BOOKS | 0.1032 | | -0.6293 ** | | 0.5317 | |
| GUIDE | 0.0880 | | 0.1247 | | 0.0912 | |
| ELECTR | 0.3681 ** | 0.3238 ** | -0.4378 ** | -0.3139 ** | 0.4240 | |
| TOWNFAR | -0.5802 ** | -0.3656 * | 0.3605 | 0.4159 * | -0.9554 | |
| <i>Teacher characteristics</i> | | | | | | |
| GENDER | -0.2897 * | -0.1789 | -0.1894 | | 0.0014 | |
| ALONE | -0.3628 * | -0.3826 ** | 0.4013 * | 0.4029 ** | -0.2933 | |
| FRENCH | 0.0799 | | -0.0271 | | 0.1092 | |
| LANGLOC | -0.0947 | | -0.0184 | | 0.1391 | |
| EXPER | -0.0108 | | -0.0069 | | -0.0654 | -0.0328 |
| BACPLUS | -0.5039 *** | -0.4569 *** | 0.2900 * | 0.2816 ** | -0.2800 | |
| DIPLPED | -0.4074 | -0.3840 * | 0.0351 | | 0.2931 | |
| NOSEM | -0.1278 | | 0.1787 | | -1.1886 | -1.4180 ** |
| <i>Contract conditions</i> | | | | | | |
| VOLUNT | -0.1281 | | 0.7959 *** | 0.6411 *** | -2.6728 ** | -3.1562 *** |
| INTERIMDIR | -0.4684 * | -0.4404 * | 0.2414 | | -1.3166 | -1.2945 |
| AFAVISIT | 0.4267 * | 0.3388 * | 0.0074 | | 0.2282 | |
| AGETPAY | -0.2237 | -0.1011 | 0.0159 | | 0.7002 | 0.7405 |
| ASECJOB | 0.2177 | | 0.1777 | | 2.2095 ** | |
| TUITION | 0.1247 | | 0.1650 | | 0.6623 | |
| ACTIVITY | 0.0649 | | -0.0276 | | 1.6130 ** | 1.7038 *** |
| UNION | 0.3811 ** | 0.1065 | 0.1161 | | -1.0589 | -0.5271 |
| PILOTPRG | -0.0314 | | 0.1224 | | -0.3240 | |
| <i>Exchange, support and control</i> | | | | | | |
| EXCHANGE | -0.1656 | | 0.1285 | | -0.1612 | |
| MEET | 0.0094 | | -0.0090 | | 0.1723 | |
| IINSPECT | -0.1914 | | 0.5105 ** | 0.4767 *** | -1.0154 | -1.1612 * |
| IADVICE | 0.1558 | | -0.0956 | | -0.7706 | -0.5946 |
| IMEETPAR | 0.3299 | | -0.2257 | | 1.2641 | 1.3972 * |
| PTORGA | -0.0062 | | 0.2029 | 0.2016 * | -0.3306 | |
| ACTIVPAR | -0.0350 | | -0.4309 *** | -0.4438 *** | 0.2337 | |
| ASSOC | -0.0112 | | -0.0784 | | 0.5428 | 0.2692 |
| <i>Overall job satisfaction</i> | | | | | | |
| JOBSATIS | | | -0.1331 | -0.3027 ** | -1.0953 * | -0.9967 * |
| <i>Country dummies</i> | | | | | | |
| CI | -0.6929 ** | -0.6570 *** | 0.5953 * | 0.1794 | -1.7338 | -1.6692 |
| CM | -0.3578 | -0.3830 | -0.0544 | -0.2398 | -1.7708 | -1.8479 * |
| MD | -0.2103 | -0.2331 | -0.3849 | -0.6262 *** | -0.6743 | -0.5572 |
| SN | -0.6074 | -0.4814 ** | -0.6985 | -1.0166 | 5.3824 * | 3.5481 *** |
| Log likelihood | -246.85 | -320.709 | -226.66 | -287.25 | -735.23 | -808.05 |
| Restr. log likelihood | -278.43 | -348.775 | -276.59 | -340.98 | | |
| LR statistic | 63.17 (39df) | 56.13 (15df) | 99.87 (40df) | 107.47 (16df) | R ² =0.21 | R ² =0.19 |
| Probabilitiy (LR stat) | 0.01 | 1.15E-06 | 5.00E-07 | 1.33E-15 | R ² (adj.)=0.10 | R ² (adj.)=0.15 |
| Obs. with Dep=0 | 188 | 240 | 225 | 278 | Censored obs. 133 | Censored obs. 144 |
| Obs. with Dep=1 | 215 | 264 | 178 | 219 | Uncens. obs. 220 | Uncens. obs. 240 |

Notes: *** significant at $\alpha=0.01$, ** significant at $\alpha=0.05$, * significant at $\alpha=0.10$.

To avoid perfect multicollinearity, the country dummy for Burkina Faso is omitted from the analysis. Burkina Faso thus becomes the county of comparison.

whether the school is situated in an urban area or at least close to it, or whether it is far away from any city (TOWNFAR).

It appears that teachers are generally less satisfied with their profession when they have to teach classes with a high number of students and when they are posted to isolated rural areas.⁵ At the same time, school equipment plays a significant role, in particular concerning prestigious items such as electricity. These variables also influence the teachers' desire to change schools. Contrary to basic items such as chalk, blackboard etc., the availability of textbooks plays a significant role here, too. Moreover, the desire for change is reduced in schools where students start off with a high level of initial knowledge.

The factors influencing teachers' absence from school seem to be different. Here, only the exceptional modes of class organization, i.e. both the multi-grade and the double-shift system, appear to exert a significant influence. Both systems lead to teachers being absent much more often.

Teacher characteristics

Regarding teachers' own characteristics, Table 3 shows a similar divide between ABSENCE and the other two dependent variables. Absence appears to be significantly less prevalent only for teachers who do not attend any continuous training seminars (NOSEM) – probably implying that the attendance of these seminars generally takes place during school hours.

CHANGE and JOBSATIS are both influenced by the teachers' educational attainment. Contrary to expectations, satisfaction with both profession and working place is reduced when teachers' attainment is high. This does not exclude that, as the famous model by Hackman and Oldham (1980) and other empirical studies (e.g. Ma 1999) would suggest, knowledge of the job and teaching competence are relevant for teacher job satisfaction. However, it seems that once teachers hold the high-school degree "baccalauréat" (BACPLUS), they face a mismatch between their professional expectations and work realities. Potential positive effects via facilitated teaching and increased self-confidence appear to be more than counterbalanced by this negative effect. The effect is the same, but less pronounced, if they hold a pedagogical degree (DIPLPED). Similar results were found by Sim (1990) and Ho (1985) for secondary school teachers in Singapore.

Language knowledge (LANGLOC and FRENCH) does not seem to play a significant role. Neither does the level of professional experience (EXPER). The two control variables indicating teachers' sex (GENDER) and their family status (ALONE),

⁵ Note that conversely, in some industrialized countries, some of the urban schools seem to be most disliked by the teachers (see e.g. Boyd et al. 2003 for the United States).

however, do seem to be relevant. It is little surprising to note that teachers staying alone without family tend to be more mobile than others. But at the same time, they display a generally lower level of job satisfaction. Moreover, on average, men seem to be less satisfied with their teaching job than women are. Similar results for other world regions were reported by Mwamwenda (1997), Ma (1999), Kremer-Hayon and Goldstein (1990), and Thompson, McNamara and Hoyle (1997).

Contract conditions

With respect to contract conditions, different groups of teachers can be distinguished. One particularly interesting group most highly represented in the Cameroonian sample are the so-called “voluntary” teachers (VOLUNT). These teachers are not civil servants, but work on private contracts of various durations and may be employed and paid by the school or even directly by their students’ parents. This implies that they generally receive lower salaries, have less job security, and that, at the same time, they are more directly responsible to their clients. While their representation in the PASEC sample of the late 1990s is still relatively limited, programs implying a massive employment of voluntary teachers have spread fast since then in numerous African countries. Accepted by policy makers as a means of increasing the number of teachers at relatively low cost, these programs often evoked fears with respect to the potentially negative effects on teachers’ job satisfaction and motivation.

It is therefore interesting to note that, at least in the sample analyzed here, there is no significant effect on JOBSATIS. However, this voluntary teachers show an extremely strong desire to change schools – probably related to the hope of employment in a more secure government position elsewhere. At the same time, absence rates are significantly lower as compared to other teachers. The coefficients can be interpreted as an indication that, on average, voluntary teachers miss about 1.5 to 2 working days less per month.⁶ The contrast between the insignificant (but negative rather than positive) effect on JOBSATIS on the one hand, and the strong effect on reduced absenteeism on the other hand suggests that the latter may be the effect of direct control, personal responsibility and the fear of consequences for further employment.⁷

The situation of voluntary teachers can be contrasted with the one of “interim directors” (INTERIMDIR), the second highest status group among primary teachers. This group of teachers enjoys stable civil servants’ employment contracts. Nevertheless,

⁶ This is a crude approximation based on the fact that the marginal effect corresponds to the coefficient of the tobit regression multiplied by the probability of an observation between the two censoring limits.

⁷ For India, Chaudhury et al. (2005) do not find the same effect of a non-civil servant status on absence rates. In this context, it should be noted that the specific contractual situation of voluntary or ‘contract’ teachers varies quite considerably across countries and over time, leading to incentive structures which may not always be fully comparable.

they appear generally to be the most disappointed regarding their job, since – as indicated by the significant and strongly negative coefficient – hardly any member of this group would choose the same profession again.

The following variables indicate some features of teachers' work realities from the directors' point of view. The latter were asked to indicate the three major reasons for teacher absenteeism. Teachers in schools where directors pointed out family visits (AFAVISIT) as a major problem appear to be clearly more satisfied with their job. Apparently they enjoy this freedom and lack of control irrespective of the impact this may have on students' learning. The necessity to collect salaries from far-away places (AGETPAY), indicated by a large number of directors in particular in Senegal, does not show any significant effect, however. And only the directors' perception that teachers' presence suffers from their second jobs (ASECJOB) is reflected in a significant and highly positive coefficient in the ABSENCE regressions indicating that the rate of absence is indeed considerably higher for this group of teachers.

The latter result is confirmed by the teachers' own statements about their additional occupations. They are captured here by the variable TUITION indicating whether the teacher gives private classes after school, and the variable ACTIVITY including any other kind of activity besides teaching. While the former shows no significant effect on any of the dependent variables, the latter leads to significantly increased rates of absence. Since this is not reflected by any apparent effect on the variable JOBSATIS, it might not necessarily indicate a low satisfaction with the teaching profession, but rather the desire or necessity to increase the family income, and the lack of control over whether this is done during class hours.

Another factor that does play a significant and positive role with respect to teachers' overall valuation of their profession is union membership (UNION). While this might indicate the support an individual teacher expects to get from a well-organized group of peers, it might also indicate something about the perceived (political) strength of the teaching profession as a whole, thereby positively influencing the individual teacher's self-esteem.

Participation of the school in pilot programs or twinning with schools from abroad (PILOTPRG) does not seem to have any relevant effect on teachers' job satisfaction.

Exchange, support and control

The final set of explanatory variables includes information on teachers' professional working conditions as members of the school and town or village community. As opposed to other studies where communication among teachers and

with principals appeared to have a strongly positive impact on teacher job satisfaction (Verdugo et al. 1997, Whaley and Hegstrom 1992, Kloep and Tarifa 1994), this effect could not be detected based on the indicators available here. Neither exchange among teachers (EXCHANGE) nor the number of regular meetings with the principal and all other colleagues (MEET) shows a significant effect on any of the dependent variables. The role of the school inspector, however, appears to be very important. Teachers do not seem to appreciate it when he comes for a proper inspection, i.e. for control of individual teachers' classroom practices (IINSPECT). As indicated by the strongly positive and highly significant effect on the variable CHANGE, teachers prefer to go to other schools to avoid this control. At the same time, on average, wherever this control takes place, absence rates per month are reduced by about one third of the average monthly absenteeism. When inspectors come only to give advice (IADVICE), this does not show any significant effect. And when they come to meet students' parents (IMEETPAR), this actually seems to increase teachers' absence from school - possibly because inspectors speak to parents and children so that neither teachers nor children attend their classes.

Contact to parents also seems to be of a certain relevance. However, surprisingly, the role of active parent-teacher organizations (PTORGA) is apparently seen in a rather negative light by the teachers concerned. Where they exist, teachers tend to have a considerably higher desire to change schools. This might again indicate their propensity to avoid control. At the same time, teachers are much less willing to change their schools when parents are active in a more direct sense (ACTIVPAR), providing manpower or finance for additional equipment or other improvements at the teacher's request. Teachers' involvement in various kinds of social, local or other organizations (ASSOC), which might be expected to ease their integration into the local community and the contact with parents, does not show any significant effect.

Interrelation of dependent variables

Finally, looking at the interrelation of the three indicators of job satisfaction, it can be noted that JOBSATIS does indeed significantly influence both CHANGE and ABSENCE in the ways expected. While this was less obvious from bivariate correlations in Table 2, once other factors are controlled for, the relationship becomes clear. This supports the role of JOBSATIS as the central indicator for job satisfaction. While it is apparent from the above discussion that the three variables JOBSATIS, CHANGE and especially ABSENCE have certain differences in their determinants, these differences do not seem to arise from the coverage of different, complementary aspects of job satisfaction. They appear, rather, to be a result of other factors - unrelated

to job satisfaction - that are also captured by the variables CHANGE and ABSENCE. With respect to the latter, this has become most obvious when looking at factors that imply any sort of control: while the lack of control is generally appreciated by teachers, it apparently leads to higher rates of absenteeism.

Other determinants

Unfortunately, despite the richness of the PASEC dataset, a considerable number of potentially relevant factors could not be tested in the above regressions. Teachers' autonomy and workload, for instance, are frequently considered in other studies (Perry, Chapman and Snyder 1995, pp. 118ff., Abu-Saad and Hendrix 1995, p. 149, Barnabé and Burns 1994, p. 179). Moreover, teacher salaries, an intensively debated and financially most relevant policy variable, could not be considered as a separate determinant.

However, where the variance of omitted variables is most relevant on the cross-national level, some of it may be captured by the country dummy variables. In fact, this could be true for salaries, since variation within countries should already have been taken into account indirectly, through teachers' educational attainment, job experience and teaching status (e.g. voluntary teachers, interim directors etc.). Most of the remainder should be general cross-country differences in the level of average teacher salaries, and in the way these salaries have evolved over time. However, relating the coefficient estimates for country dummies to available information on average primary teacher salaries does not lead to any clear relationship. According to MINEDAF (2002) and Mingat and Suchaut (2000), teachers in Madagascar and Cameroon get by far the lowest relative salaries and yet, the dummy variables imply that teacher job satisfaction in these countries is relatively high, even after correction for all other variables.⁸ This does not necessarily imply that salaries have no influence on teacher job satisfaction, but it shows that, in any case, this influence is not strong enough to dominate other country-specific effects. This is consistent with Hanushek, Kain and Rivkin's (1999) finding that salaries are only weakly related to teacher mobility and student performance.

6. Job satisfaction and learning outcomes

Teacher job satisfaction can of course be regarded as an objective in itself, and as mentioned earlier, this is the case in many studies of educational scientists. Ultimately, it is often looked upon, however, as a means to promote good teaching and thus high

⁸ There is no country dummy for Burkina Faso in order to avoid perfect multicollinearity. Burkina Faso thereby becomes the country of comparison.

education quality. In order to analyze this second link, earlier studies have generally needed to recur to problematic indirect indicators. Perry, Chapman and Snyder (1995) for instance, use the observation of differences in teaching methods that are assumed to be correlated to learning outcomes. As described in section 2, this is where the PASEC dataset has its comparative advantage since it provides direct information on student achievement on an internationally comparative basis both at the beginning and the end of the academic year.

6.1. Methodology

In order to test the link between teacher job satisfaction and education quality, student achievement at the end of the year (RATE2_S) can simply be regressed on JOBSATIS controlling for students' initial knowledge (RATE1_S and RATESN1_S) and other relevant determinants of student learning.

When computing the regression model, it has to be taken into account that information is available at two levels:

- (i) Level 1 – student level: achievement data, family characteristics etc.
- (ii) Level 2 – school or class level⁹: teacher and school characteristics, classroom equipment etc.

In this setting, school level observations for different students within the same class are obviously not independent of each other. The hierarchical data structure thus leads to a violation of the usual assumptions for OLS regressions and to downward biased OLS estimates for standard errors. However, the correct error structure can be captured using a simple two-level hierarchical linear model (HLM).¹⁰

For $i=1, \dots, N_j$ students in $j=1, \dots, J$ classes, this model can be written as:

Level 1 (students): $y_{ij} = Z_{ij} \alpha + X_{ij} \beta_j + r_{ij}$

Level 2 (schools): $\beta_j = B_j \rho + u_j$

Reduced form: $y_{ij} = Z_{ij} \alpha + X_{ij} B_j \rho + X_{ij} u_j + r_{ij}$,

where y_{ij} is the dependent variable, Z_{ij} are explanatory level 1 variables whose influence is independent of school level variables, and B_j are explanatory variables at level 2. The corresponding fixed coefficients are α and ρ , and r_{ij} and u_j are residuals at

⁹ School and class levels are identical here, since only one class is considered in each school.

¹⁰ For more general information on HLM see Raudenbush and Bryk (2002) and Goldstein (2003). For a more complex application with cross level effects and three hierarchical levels equally based on PASEC data, see Michaelowa (2001a).

levels 1 and 2 respectively. The interesting feature is the link between both levels provided by the random coefficients β_j that are introduced as coefficients for student level data X_{ij} but explained by information available at school level. The reduced form of the model, which integrates both student and school level variables, finally differs from the ordinary regression model only through the term $X_{ij} u_j$. In the specification chosen here, X_{ij} will simply represent a constant term whose coefficient is allowed to vary across schools. Therefore, the equation boils down to a simple random effects model (as known for instance from panel econometrics) whereby the random effects capture unobserved differences between individual schools.

From the reduced form, it becomes obvious that the overall error term is $X_{ij} u_j + r_{ij}$ whose covariance is inevitably different from zero for two students of the same school, even if the individual error terms are assumed to fulfill the usual conditions of having zero mean and being uncorrelated among each other and across different i or j .

Estimating the reduced form of the model using ML techniques and the expectation-maximization (EM) algorithm described in the technical appendix of Bryk and Raudenbush (1992) leads to the results presented in Table 4. While a greater number of control variables was introduced in earlier regressions (see e.g. Michaelowa 2000 and 2001a), regression 7 displayed here is restricted to those variables with a significant or close to significant influence at a level of 10%, and to the country dummies. Regression 8 differs from regression 7 by introducing two further variables for comparison with the discussion in the previous section. Again, all variables are explained in detail in the appendix.

6.2. Results

It appears that indeed, as expected, teacher job satisfaction does exert a positive and significant influence on student learning. This may be interpreted as a translation of job satisfaction into motivation, i.e. higher effort on the job, which in turn leads to higher outcomes. As students' initial knowledge (RATE1_S, RATESN1_S) is included as a control variable, there should be no risk of endogeneity bias resulting from the potential influence of students' level of knowledge on job satisfaction. However, it cannot be excluded that an endogeneity bias arises with respect to students' learning within the year of analysis. In this case, a cautious interpretation of the coefficient would imply to understand it as an upper limit of the true effect of teacher job satisfaction on student achievement.

Among the control variables, at student level, each child's initial knowledge plays the predominant role. Apart from that, children of higher age (AGEPLUS) and children having repeated one or several classes before reaching the fifth grade

(REPEAT2) seem to be at a disadvantage. Conversely, French speaking students (FRENCH_S), and students equipped with radio and/or television (MEDIA) and books (LIBRARY) at home, tend to perform better. A discussion of the results of other studies analyzing these and other student level determinants of educational outcomes can be found in Michaelowa (2000, 2001a) and Michaelowa and Wechtler (2006).

Table 4: Determinants of student achievement

| Dependent variable | RATE2_S | RATE2_S |
|--|----------------------|----------------------|
| Method: | HLM (2 levels) | HLM (2 levels) |
| N (number of student level observations) | 6664 | 6664 |
| J (number of school level observations) | 386 | 386 |
| Explanatory variables at student level | Coefficients Regr. 7 | Coefficients Regr. 8 |
| RATE1_S | 0.520*** | 0.520*** |
| RATESN1_S | 0.731*** | 0.713*** |
| AGEPLUS | -0.013*** | -0.013*** |
| FRENCH_S | 0.006* | 0.005* |
| REPEAT2 | -0.010*** | -0.010*** |
| MEDIA | 0.006*** | 0.006*** |
| LIBRARY | 0.006** | 0.006* |
| Explanatory variables at school level | Coefficients Regr. 7 | Coefficients Regr. 8 |
| JOBSATIS | 0.017** | 0.016** |
| VOLUNT | 0.028* | 0.026 |
| INSPECT | 0.027** | 0.028** |
| TUITION | | 0.016 |
| ACTIVITY | | -0.004 |
| EDUCATION | 0.012*** | 0.012*** |
| TRAINING | 0.017*** | 0.017*** |
| EXPER | 0.006*** | 0.006*** |
| EXPER2 | -0.000** | -0.000** |
| LANGLOC | 0.014 | 0.014 |
| DOUBLESIFT | -0.025* | -0.024* |
| MULTGRAD | 0.033* | 0.033* |
| STUDNUMB | 0.002*** | 0.002*** |
| STUDNUMB2 | -0.000*** | -0.000*** |
| BOOKS | 0.030** | 0.029** |
| TOWN | 0.014 | 0.013 |
| CI | -0.037* | -0.036** |
| CM | 0.005 | 0.007 |
| MD | 0.001 | 0.002 |
| SN | -0.079*** | -0.080*** |
| Overall fit of regression (as compared to the model empty at both levels simultaneously) | | |
| R ² (student level) | 0.37 | 0.37 |
| R ² (school level) | 0.52 | 0.52 |

Notes: *** significant at $\alpha=0.01$, ** significant at $\alpha=0.05$, * significant at $\alpha=0.10$.

In order to avoid perfect multicollinearity, the country dummy for Burkina Faso is omitted here. Burkina Faso thus becomes the country of comparison.

Here however, it seems more relevant to move quickly to level 2 variables, and this not simply for the purpose of evaluating their influence on student learning, but

rather to discuss this influence in relation to the influence of the same variables with respect to teachers' job satisfaction.

Indeed, it should be noted that many of the variables already shown to be relevant for teachers' job satisfaction also exert a direct influence on student achievement. Trying to combine the objectives of teacher job satisfaction and education quality is thus equivalent to selecting those factors which positively influence both variables or at least positively influence one without negatively influencing the other. Looking at individual coefficients, the relative efficiency of these strategies can also be determined.

7. Increasing both job satisfaction and education quality

Trying to combine the objectives of teacher job satisfaction and student achievement, the easiest procedure seems to be to check – one by one – the coefficients of level 2 variables presented in Table 4 and to compare them with the results from section 4.

The first two variables give some indication on teachers' reaction to performance incentives. As mentioned earlier, in developing and industrialized countries alike, this issue has raised much interest in recent years (see e.g. Lavy 2002 and 2004, Hanushek 2002, Eberts, Hollenbeck and Stone 2002, Khan 2002). Moreover, the VOLUNT variable appears to be particularly relevant from the viewpoint of current reforms of the teaching profession in many African countries. It turns out that despite their typically lower salary and relatively insecure contract position, voluntary teachers tend to perform better than their colleagues. In regression 7, the coefficient is significant, and in regression 8 it is almost significant at the level of 10%. Regressions 5 and 6 also showed that voluntary teachers are absent from work considerably less often than other teachers. At the same time, regressions 3 and 4 provided some evidence of the fact, that teachers do not particularly appreciate this type of contract situation. In fact, it might be precisely the hope of achieving a better and more secure position in the civil service that induces voluntary teachers to take their work very seriously and to perform comparatively well. It may also be that the threat of losing their post acts as an extrinsic motivator. Apparently, with respect to the contract situation, there is thus a conflicting relation between the teachers' level of well-being and the control and incentive mechanisms to induce good teaching practices.

This conflict is known from the broader literature on the relationship between economic incentives and intrinsic motivation. Frey and Oberholzer-Gee (1997) and Bénabou and Tirole (2003) analyze situations in which rewards or punishments may crowd out intrinsic motivation. Regression results from regressions 7 and 8 suggest that even taking potential crowding out into account, voluntary teacher contracts seem to be

rather effective. The coefficient estimates for VOLUNT is considerably higher than the (potentially even overestimated) coefficient for JOBSATIS. Moreover, it should be kept in mind that in the initial regressions, the negative impact of VOLUNT on JOBSATIS was not even significant. All in all, our evidence does not lend any support to fears that voluntary teacher programs may undermine education quality.

Nevertheless, it should be noted that recent large scale voluntary teacher programs are carried out in different ways in the different countries concerned. The implications for both teacher incentives and motivation vary accordingly, and it cannot surprise that evaluations of these programs in different countries also show largely diverging effects on student achievement (see e.g. CONFEMEN/PASEC 2003, 2004a, 2004b, 2004c, and Bourdon, Frölich and Michaelowa 2006). However, clearly, the available evidence reveals that the conditions most favored by teachers do not always correspond to the situation which is optimal for students' learning.

The situation is similar as far as inspections of classroom practices are concerned. Again, previous regressions showed that the control effect related to these inspections is strongly disliked by the teachers concerned. At the same time, regressions 7 and 8 show that these inspections are clearly performance enhancing.¹¹ Just as for VOLUNT, the coefficient of INSPECT is much higher than the coefficient of JOBSATIS, so that this result holds even if the potential crowding-out of intrinsic motivation is taken into account.

Private tuition (TUITION) and other activities (ACTIVITY) are often believed to be the major vehicle translating bad financial teaching conditions into bad teaching performance. UNICEF (1999, p. 39) states that low salaries force many primary school teachers in Africa into other activities, often to the detriment of teaching – as shown above by the effect of ACTIVITY on ABSENCE in regressions 5 and 6. The African Development Bank (AfDB 1998, p. 197) goes even further identifying low salaries as the factor the most harmful for the education system altogether and suggesting that teachers tend to reserve their pedagogical skills and material for the more highly remunerated private tuition in the afternoon. However, these effects which are included in regression 8 do not turn out to be significant here. As suggested in Michaelowa (2000), reasons might be that teachers following other activities are generally more dynamic, and that private tuition often benefits a teacher's own students – even though this leads to a hidden additional cost of schooling which may be difficult to bear for many families.

¹¹ Note that in the context of regressions 7 and 8, no significant differences could be made out between various objectives of an inspector's visit, so that for simplification, these visits are presented in a single variable INSPECT here.

Looking now at teachers' educational attainment (EDUCATION) and participation in training seminars (TRAINING), the results in Table 4 indicate a clearly positive impact on students' learning. Unfortunately, and contrary to what might have been expected, higher educational attainment appeared to have a negative rather than positive influence on job satisfaction in regressions 1-4. It should be noted, however, that this negative relationship was shown with respect to only one specific level of education, the baccalauréat (BACPLUS). It is less pronounced (although still significant) if the variable EDUCATION is used that allows for gradually increasing levels of education from 6th grade onwards. This suggests that, while teachers with high educational attainment might be discouraged by their professional career perspectives, the negative relationship does not necessarily hold for very low attainment levels. In fact, extremely low levels of teachers' educational attainment might be equally discouraging due to the difficulties faced with regard to competently carrying out their job. In any case, if the intention is to improve both teachers' job satisfaction and student achievement, raising teachers' educational level beyond the baccalauréat does not seem to be a sensible policy measure. This is interesting to note since this excludes one particularly costly policy measure given that higher educational attainment is generally accompanied by higher pay.

The effects of teachers' experience (EXPER, EXPER2) and their knowledge of the local language (LANGLOC) are of less interest here. Neither of the two variables showed any significant impact on job satisfaction. With respect to student achievement, the positive coefficient of LANGLOC remains slightly below the 10% level of significance, too. Increasing job experience initially fosters student achievement, but the positive effect fades out after some time and then even becomes negative. In any case, EXPER is a mere control variable that cannot be used for policy-making.

With respect to policy-making, it is very interesting, however, to consider the variables of class management (DOUBLES SHIFT and MULTGRAD) as well as class size (STUDNUMB, STUDNUMB2). In regressions 1 and 2, a big class size was shown to have a clearly negative impact on teacher job satisfaction. Just as in the case of salaries, it is often assumed that reducing class size might be a perfect tool to improve both teacher job satisfaction and education quality. However, the link between class size and educational outcomes is less clear than it might appear. Hanushek (1998) provides an interesting overview over a large number of studies with very mixed results. Michaelowa (2001b) provides details for the relationship in each of the five countries considered here. Overall, it appears from regressions 7 and 8 that the impact follows a quadratic function. Based on the regression estimates, it can be calculated that – at least under prevailing teaching methods – a negative impact of increased student numbers

can be felt only from about 65 students onwards. Even then, the impact remains relatively moderate and does not increase very fast. While the effect of reduced student numbers is thus strongly relevant for teachers' well-being, its impact on student learning is far less obvious.

With respect to the effect of the double-shift class structure, however, there finally appears to be a correspondence between both the negative effect on teachers' job satisfaction and the negative effect on education quality. Double-shift classes often put teachers under considerable strain since they generally have to deal with two consecutive groups of students, without much time for preparation in between. At the same time, the students of each group often spend a reduced time-period in school, even if this is not always intended by educational planners. A further problem might be that timings are often problematic for at least one group with respect to climatic influences (e.g. heat in the early afternoon) or life rhythms (e.g. having to get up very early without breakfast).¹² In any case, this system apparently leads to considerably reduced student achievement and an increased absence of teachers from their work.

Since double-shift classes are generally introduced to cope with high student numbers, it is interesting to compare the effect of this variable with the impact of class size. Given the parameter estimates of regressions 7 and 8, it can be calculated that only with a class size of over 100 students does it make sense to divide the class into two groups.¹³ This reasoning is based merely on grounds of educational quality and does not take into account that double-shift management also implies additional costs. Even if no extra teacher is employed, the existing teacher has to be paid for additional working hours, and often at expensive overtime rates.

With respect to teacher job satisfaction, regression 1 indicates that the loss of well-being due to a double-shift structure is higher than the loss of well-being due to about 20 additional students in the class. However, this calculation has to be considered with some caution, since the variable DOUBLESIFT is not significant in regression 1.

Teachers' attitude towards the multi-grade system is less clear. This specific type of class management appears to have a positive rather than a negative impact on student achievement. However, as shown in regressions 5 and 6, it goes hand in hand with surprisingly high rates of teacher absenteeism. At the same time, teachers do not show any particular disliking of the system, since the coefficient of MULTGRAD is non- significant (and even positive) with respect to JOBSATIS in regression 1. All in

¹² For these and other possible reasons of the negative impact of double-shift classes, see CONFEMEN (2003).

¹³ Given the regression coefficients in regressions 7 and 8, the exact number of students for which the options of double-shift and single-class organization lead to the same overall achievement is 105. Since the calculation is based on estimates, however, the exactitude of this figure should not be overvalued.

all, the multi-grade system appears to be a sensible management tool that is not in conflict with the objectives of education quality and teacher job satisfaction. However, it should be remembered that it is a tool relevant only for specific situations of small student numbers in remote areas. Moreover, further analysis is needed considering the high rates of teacher absenteeism it implies.

Concerning the relevance of classroom equipment, regressions 7 and 8 indicate a clearly positive effect of textbooks on student learning. At the same time, regressions 3 and 4 suggest that the availability of textbooks also has a positive impact on teacher job satisfaction. Improving the availability of textbooks might thus indeed be a valuable and generally applicable instrument to improve both teachers' job satisfaction and education quality. Some caution is required, though, since the effect on job satisfaction is significant only with respect to the variable *CHANGE* thereby indicating teachers' desire to teach at those schools which are best equipped. This might partly reflect the tendency to choose the relatively most prestigious schools, rather than a positive valuation of books as a relevant tool of instruction. It should in fact be considered that when textbooks are newly introduced teachers need to spend time and effort to adjust to the new methods of instruction. Possibly, the positive effect of the availability of textbooks on job satisfaction would come out more clearly in the regressions of *JOBSATIS* as well, if teachers were generally provided with pedagogical support and training for the adjustment period. All in all, however, even as the situation is now, improving the availability of textbooks appears to be a relevant policy measure that, in addition, can be implemented at relatively low cost.

Finally, it can be noted that teachers not only prefer to teach in urban schools or schools close to urban areas, but that these schools also tend to provide better learning conditions (even though this effect is not fully significant since many related variables have already been controlled for). Unfortunately, however, this is no relevant policy variable, since broad educational coverage requires rural schools.

8. Conclusions

Given the relevant determinants of teacher job satisfaction analyzed in section 4 and the relevant determinants of student achievement presented in sections 5 and 6, evidence in this paper is consistent with the expectation that there is a positive impact of teacher job satisfaction on education quality and that therefore, education quality can be influenced by influencing teacher job satisfaction.

However, since many variables have a simultaneous direct impact on both teacher job satisfaction and student achievement, not all factors positively influencing teacher job satisfaction will actually lead to better educational outcomes. In fact, as

discussed in section 6, in many cases the relationship between the objectives of improving job satisfaction and student achievement is conflicting rather than complementary. In particular, variables implying a control system and incentive structures based on a lack of job security seem to have considerable positive effects on teachers' performance while, at the same time, they appear to be strongly disapproved by the teachers concerned. This conflict between the objectives of raising education quality and improving teachers' job satisfaction is particularly obvious with respect to the impact of inspections and non civil service teaching contracts.

There are only a few variables, in fact, the impact of which is unambiguously positive regarding both objectives. One is related to classroom equipment, which clearly shows a positive effect on teachers' well-being. Among the equipment variables, many do not show any significant influence on student achievement, and were therefore not even presented in the regressions in section 6. This is different, however, for students' equipment with textbooks, which is both highly relevant for student achievement, and positively related to teacher job satisfaction. Improving the availability of textbooks is therefore certainly a relevant policy choice.

Another interesting feature is the correspondence between the negative effect of double-shift classes on student learning, and the disliking of teachers for this type of class management. It becomes clear that for both teachers and students, increasing class size would generally be the preferable measure to deal with high student numbers. The negative effect of double-shift classes is so strong that this is true for class sizes up to about 100 students.

The frequently stated hypothesis that low salaries and plethoric class sizes are the major source of both low teacher job satisfaction and low student performance does not find much support here. Admittedly, teachers' salaries are only indirectly measured through specific contract conditions and country dummies, and additional information on individual teachers' salaries is required to further analyze their impact.

Class size does have a considerably negative impact on teacher job satisfaction. Reducing class size would, however, imply engaging more teachers and thereby considerably increase costs. At the same time, the negative impact on educational outcomes seems to be relevant only from a high level of about 65 students onwards. Even then the effect of additional students remains moderate. In this context, and given the relevance of improved access to education in all of the African countries considered here, reducing class size should not become a general policy priority.

Finally, it should be noted that a certain conflict between the objectives of teacher job satisfaction and student achievement also arises with respect to teachers' own qualification level. While there is a uniformly positive relationship between their

level of educational attainment and educational outcomes, teachers beyond a certain level of qualification (in particular, the baccalauréat) appear to be very disappointed about the realities of their professional life. This result should be taken into account when it is considered raising the academic requirements for entering the teaching profession, especially since, just as reducing class size and increasing teacher salaries, this is one of the more expensive measures to improve the education systems in these countries.

All in all, it can be concluded that the most intensively debated and highly cost-intensive policy measures often assumed to be of major importance for both teacher job satisfaction and student achievement do not find much support in the analysis of this study. However, simple and relatively cheap measures such as the provision of textbooks seem to be unambiguously positive. Moreover, since conflicts between the objectives of teacher job satisfaction and education quality appear to be more relevant than expected, it may become unavoidable to promote one objective to the detriment of the other. For instance, one would probably not be willing to give up performance enhancing inspections, simply because teachers seem to dislike control. Moreover, one should further encourage the employment of voluntary teachers with flexible non civil servant contracts, which appear to be an efficient and performance enhancing means to increase the number of teachers. As the concrete structure of voluntary teacher programs varies quite considerably from country to country, ongoing PASEC country evaluations can be expected to provide interesting additional insights into the optimal implementation of these reforms in the future.

References

- Abangma, M. A. (1981), A Study of Primary Teachers' Attitudes Towards Ruralisation of School Curriculum in English Speaking Cameroon, unpublished Ph.D. thesis, University of London, London
- Abu-Saad, Ismael; Hendrix, Vernon (1995), Organizational Climate and Teachers' Job Satisfaction in a Multi-Cultural Milieu: The Case of The Bedouin Arab Schools in Israel, in: International Journal of Educational Development, Vol. 15, No. 2, pp. 141-153
- AfDB (1998), Rapport sur le Développement en Afrique 1998, Abidjan
- Banerjee, Abhijit; Duflo, Esther (2006): Addressing Absence, in : Journal of Economic Perspectives, Vol. 20, No. 1, pp. 117-132
- Banya, Kingsley; Elu, Juliet (1997), Implementing Basic Education: An African Experience, in: International Review of Education, Vol. 43, No. 5-6, pp. 481-496
- Barnabé, Clermont; Burns, Mildred (1994), Teacher Job Characteristics and Motivation, in: Educational Research, Vol. 36, No. 2, pp. 171-185

- Bénabou, Roland; Tirole, Jean (2003), Intrinsic and Extrinsic Motivation, in: Review of Economic Studies, Vol. 70, No. 3, pp. 489-520
- Bernard, Jean-Marc (1999), Les Enseignants du Primaire dans Cinq Pays du Programme d'Analyse des Systèmes Educatifs de la CONFEMEN : Le Rôle du Maître dans le Processus d'Acquisition des Elèves, Report for the Working Group on the Teaching Profession, ADEA, French Section, Paris
- Bourdon, Jean; Frölich, Markus; Michaelowa, Katharina (2006), Broadening Access to Primary Education: Contract Teacher Programs and Their Impact on Education Outcomes in Africa – an Econometric Evaluation for the Republic of Niger, in: Menkhoff, Lukas (ed.): Pro-Poor Growth: Issues, Policies, and Evidence, Berlin: Duncker & Humblot, forthcoming
- Boyd, Donald; Lankford, Hamilton; Loeb, Susanna; Wyckoff, James (2003), The Draw of Home: How Teachers' Preferences for Proximity Disadvantages Urban Schools, NBER Working Paper No. 9953, Cambridge
- Bryk, Anthony S.; Raudenbush, Stephen W. (1992), Hierarchical Linear Models: Application and Data Analysis Models, Advanced Qualitative Techniques in the Social Sciences No.1, London: Sage
- Chaudhury, Nazmul; Hammer, Jeffrey; Kremer, Michael; Muralidharan, Karthik; Rogers, Halsey (2006), Missing in Action: Teacher and Health Worker Absence in Developing Countries, in: Journal of Economic Perspectives, Vol. 20, No. 1, pp. 91-116
- Chivore, B.R.S. (1988), Factors Determining the Attractiveness of the Teaching Profession in Zimbabwe, in: International Review of Education, Vol. 34, No 1, pp. 59-78
- CONFEMEN (1999), PASEC: Les Facteurs de l'Efficacité dans l'Enseignement Primaire: Données et Résultats sur Cinq Pays d'Afrique et de l'Océan Indien, CD-ROM, Dakar
- CONFEMEN/PASEC (2003), Le Programme de formation initiale des maîtres et la double vacation en Guinée, Dakar : CONFEMEN
- CONFEMEN/PASEC (2004a), Impact du statut enseignant sur les acquisitions dans le premier cycle l'enseignement fondamental public au Mali, Dakar : CONFEMEN
- CONFEMEN/PASEC (2004b), Les enseignants contractuels et la qualité de l'enseignement de base I au Niger : Quel bilan ?, Dakar : CONFEMEN
- CONFEMEN/PASEC (2004c), Recrutement et formation des enseignants du premier degré au Togo : Quelles priorités ?, Dakar : CONFEMEN
- Duflo, Esther; Hanna, Rema (2005): Monitoring Works: Getting Teachers to Come to School, NBER Working Paper No. 11880, Cambridge
- Eberts, Randall; Hollenbeck, Kevin; Stone, Joe (2002), Teacher Performance Incentives and Student Outcomes, in: Journal of Human Resources, Vol. 37, No. 4, pp. 913-927
- Evans, Linda (1997), Addressing Problems of Conceptualization and Construct Validity in Researching Teachers' Job Satisfaction, in: Educational Research, Vol. 39, No. 3, pp. 319-331

- Francken, Nathalie; Minten, Bart; Swinnen, Johan (2005): The Impact of Media and Monitoring on Corruption in Decentralized Public Programs: Evidence from Madagascar, LICOS Discussion Paper No.15505, LICOS - Centre for Transition Economics, K.U.Leuven
- Frey, Bruno; Oberholzer-Gee, Felix (1997), The Cost of Price Incentives: An Empirical Analysis of Motivation Crowding-Out, in: American Economic Review, Vol. 87, No. 4, pp. 746-755
- Garret, Roger (1999), Teacher Job Satisfaction in Developing Countries, Education Research Supplementary Series (G), London: DFID
- Glewwe, Paul; Jacoby, Hanan (1994), Student Achievement and Schooling Choice in Low-Income Countries: Evidence from Ghana, in: Journal of Human Resources, Vol. 29, No. 3, pp. 834-864
- Glewwe, Paul; Kremer, Michael; Moulin, Sylvie (2000), Textbooks and Test Scores: Evidence from a Prospective Evaluation in Kenya, mimeo, Development Research Group, World Bank, Washington
- Glewwe, Paul, Kremer, Michael, Moulin, Sylvie; Zitzewitz, Eric (2004), Retrospective vs. Prospective Analysis of Flip Charts in Kenya, in: Journal of Development Economics, Vol. 74, No. 1, pp. 251-268
- Glewwe, Paul; Kremer, Michael (2006), Schools, Teachers, and Education Outcomes in Developing Countries, in: Hanushek, Eric; Welch, Finis (eds): Handbook of the Economics of Education, Vol. 1, Amsterdam: Elsevier, Ch. 16
- Goldstein, H. (2003), Multilevel Statistical Models, 3rd edition, London: Edward Arnold
- Greene, William (2003): Econometric Analysis, 5th edition, Prentice Hall: Pearson Education
- Hackman, J.Richard; Oldham, Greg (1980), Work Redesign, Reading: Addison-Wesley
- Hall, Bruce W.; Pearson, L. Carolyn; Carrol, DeLos (1992), Teachers' Long-Range Teaching Plans: A Discriminant Analysis, in: Journal of Educational Research, Vol. 85, pp. 221-225
- Hanushek, Eric A. (1998), The Evidence on Class Size, Occasional Paper No. 98-1, W. Allen Wallis Institute of Political Economy, University of Rochester
- Hanushek, Eric A. (2002), Teacher Quality, in: Lance Izumi and Williamson Evers (eds): Teacher Quality, Stanford: Hoover Institution Press, pp. 1-12
- Hanushek, Eric A.; Kain, John F.; Rivkin, G. (1999), Do Higher Salaries Buy Better Teachers?, paper prepared for the annual meeting of the American Economic Association, January 3-5, New York
- Herzberg, Frederick (1968), Work and the Nature of Man, London: Sapples Press
- Ho, Juan Beng (1985), A Study of Job Satisfaction of Teachers in Singapore, unpublished M.Ed. dissertation, National University of Singapore
- Hoy, Wayne; Miskel, Cecil (1996), Educational Administration: Theory, Research and Practice (5th edition), New York: McGraw-Hill

- IEA (2001), About TIMSS and TIMSS-Repeat, <http://www.timss.org/timss1995i/AboutTIMSS.html> (22/05/01)
- Jaag, Christian (2005), Hidden Teacher Effort in Educational Production: Monitoring vs. Merit Pay, mimeo, Institute of Public Finance and Fiscal Law, University of St. Gallen
- Khan, Sharukh-Rafi (2002), Rationality in Public Sector Salary Scales: The Case of Rural Teachers in Pakistan, in: *Education Economics*, Vol. 10, No. 3, pp. 333-345
- Kloep, Marion; Tarifa, Fatos (1994), Working Conditions, Work Style and Job Satisfaction among Albanian Teachers, in: *International Review of Education*, Vol. 40, No. 2, pp. 159-172
- Kremer-Hayon, Lya; Goldstein, Zahava (1990), The Inner World of Israeli Secondary School Teachers: Work Centrality, Job Satisfaction and Stress, in: *Comparative Education*, Vol. 28, No. 2-3, pp. 285-298
- Lam, Peter; Foong, Yoke Y.; Moo, Swee N. (1995), Work Life, Career Commitment, and Job Satisfaction as Antecedents of Career Withdrawal Cognition among Teacher Interns, in: *Journal of Research and Development in Education*, Vol. 28, pp. 30-236
- Lavy, Victor (2002), Evaluating the Effect of Teachers' Group Performance Incentives on Pupil Achievement, in: *Journal of Political Economy*, Vol. 110, No. 6, pp. 1286-1317
- Lavy, Victor (2004), Performance Pay and Teachers' Effort, Productivity and Grading Ethics, NBER Working Paper No. 10622, Cambridge
- Lee, Valerie; Zuze, Linda.; Ross, Kenneth (2005), School Effectiveness in 14 Sub-Saharan African Countries: Links With 6th Graders' Reading Achievement, in: *Studies in Educational Evaluation*, Vol. 31, No. 2-3, pp. 207-246
- Ma, Xin (1999), Influences of Workplace Conditions on Teachers' Job Satisfaction, in: *Journal of Educational Research*, Vol. 93, pp. 39-47
- Maclure, Richard (1997), Overlooked and Undervalued - A Synthesis of ERNWACA Reviews on the State of Education Research in West and Central Africa, Report for the SARA Project of USAID, Washington, D.C.
- Menlo, A.; Poppleton, P. (1990), A Five Country Study of the Work Perceptions of Secondary School Teachers in England, the United States, Japan, Singapore and West Germany (1986-88), in: *Comparative Education*, Vol. 26, No. 2-3, pp. 173-182
- Maslow, Abraham H. (1954), *Motivation and Personality*, New York: Harper & Row.
- Michaelowa, Katharina (2000), Dépenses d'Education, Qualité de l'Education et Pauvreté – l'Exemple de Cinq Pays d'Afrique Francophone, OECD Development Centre Technical Paper No. 157, Paris
- Michaelowa, Katharina (2001a), Primary Education Quality in Francophone Sub-Saharan Africa: Determinants of Learning Achievement and Efficiency Considerations, in: *World Development*, Vol. 29, No. 10, pp. 1699-1716

- Michaelowa, Katharina (2001b), *Scolarisation et Acquis des Elèves: Les Indicateurs de Résultats dans l'Analyse des Politiques de l'Enseignement en Afrique Francophone*, in: *Politiques d'Education et de Formation*, Vol. 1, No. 3, pp. 77-94
- Michaelowa, Katharina; Wechtler, Annika (2006), *The Cost-Effectiveness of Inputs in Primary Education: Insights from the Literature and Recent Student Surveys for Sub-Saharan Africa*, ADEA Working Document, Paris: ADEA
- Mingat, Alain; Suchaut, Bruno. (2000), *Les Systèmes Educatifs Africains: une Analyse Economique Comparative*, Brussels: De Boeck
- MINEDAF (2002), *Scolarisation primaire universelle: un objectif pour tous (Universal Primary Education: an Objective for All)*, Statistical Document for the 8th conference of African ministers of education (MINEDAF VIII)
- Mwamwenda, Tuntufye S. (1997), *Marital Status and Teachers' Job Satisfaction*, in: *Psychological Reports*, Vol. 80, pp. 521-522
- Nabi, S. R. (1995), *The Impact of an Educational Innovation on Students' Performance. Classroom Practice and Teachers' Behaviours in Chitral, Pakistan*, unpublished EdD thesis, University of Bristol, Bristol
- N'guilé, Frédéric (2000), *La Paupérisation de la Fonction Enseignante en République Centrafricaine*, mimeo, University of Bangui, Bangui
- Nias, Jennifer (1981), *Teacher Satisfaction and Dissatisfaction: Herzberg's 'Two-Factor Hypothesis Revisited*, in: *British Journal of Sociology of Education*, Vol. 2, No. 3, pp. 235-246
- OECD (2001), *Knowledge and Skills for Life, First Results from PISA 2000*, Paris
- OECD/UNESCO-UIS (2003), *Literacy Skills for the World of Tomorrow, Further Results from PISA 2000*, Paris
- Perry, Patricia; Chapman, David; Snyder, Conrad (1995), *Quality of Teacher Worklife and Classroom Practices in Botswana*, in: *International Journal of Educational Development*, Vol. 15, No. 2, pp. 115-125
- Postlethwaite, Neville (1998), *The Conditions of Primary Schools in Least-Developed Countries*, in: *International Review of Education*, Vol. 44, No. 4, pp. 289-317
- Raudenbush, Stephen; Bryk, Anthony (2002), *Hierarchical Linear Models: Applications and Analysis Methods*, 2nd edition, Thousand Oaks: Sage
- Reinikka, R. and Svensson, J. (2003), *The Power of Information: Evidence from a Newspaper Campaign to Reduce Capture*, Policy Research Working Paper No. 3239, Washington: World Bank
- Ross, Kenneth (1998) (ed.), *SACMEQ Policy Research, The Quality of Education : Some Policy Suggestions Based on a Survey of Schools*, (Report No. 1: Mauritius, by Dhurmbeer Kulpo ; Report No. 2: Namibia, by Friedhelm Voigts ; Report No. 3: Zimbabwe, by Thomas Machingaidze, Patrick Pfukani and Sibangani Shumba ; Report No. 4: Zanzibar, by Sebtuu Nassor and Khadija Ali Mohammed; Report No. 5: Zambia, by Manasseh Nkamba and Joe Kanyika) Paris: IIEP

- Sim, Wong Kooi (1990), Factors Associated with Job Satisfaction and Work Centrality among Singapore Teachers, in: Comparative Education, Vol. 26, No. 2-3, pp. 259-276
- Somech, Anita; Drach-Zahavy, Anat (2000): Understanding extra-role behavior in schools: the relationships between job satisfaction, sense of efficacy, and teachers' extra-role behavior. Teaching and Teacher Education. Vol. 16, pp. 649-659
- Spear, M.; Gould, K.; Lee, B. (2000), Who Would Be a Teacher? A Review of Factors Motivating and Demotivating Prospective and Practising Teachers, NFER, Slough
- Thompson, David P.; McNamara, James F.; Hoyle, John R. (1997), Job Satisfaction in Educational Organizations: A Synthesis of Research Findings, in: Educational Administration Quarterly, Vol. 33, No. 1, pp. 7-37
- UNESCO-Santiago (1998), Primer Estudio Internacional Comparativo, Santiago
- UNICEF (1999), The State of the World's Children 1999: Education, New York
- Verdugo, Richard R.; Greenberg, Nancy M.; Henderson, Ronald D.; Uribe, Oscar; Schneider, Jeffrey M. (1997), School Governance Regimes and Teachers' Job Satisfaction: Bureaucracy, Legitimacy and Community, in: Educational Administration Quarterly, Vol. 33, pp. 38-66
- Whaley, Kanada; Hegstrom, Timothy (1992), Perceptions of School Principal Communication Effectiveness and Teacher Job Satisfaction on the Job, in: Journal of Research and Development in Education, Vol. 25, pp. 224-231
- Wittmann, Eveline (2002), Predictors of Teacher Job Satisfaction, mimeo, Humboldt University, Berlin
- Wößmann, Ludger (2005), Competition, Decentralization and Accountability: Lessons for Education Policies in Developing Countries from International Achievement Tests, in: Nord-Süd Aktuell, Vol. 19, No. 2, pp. 142-153
- World Bank (2003), World Development Indicators, CD-ROM, Washington

Appendix

Variable definitions

| | |
|------------|---|
| ABSENCE | Number of days teacher was absent from school during the last month (max=25) |
| ACTIVITY | Dummy (teacher follows other non teaching/school related activities, such as farming, shop-keeping etc.=1, no such activities=0) |
| ACTIVPAR | Dummy (students' parents are easily mobilized =1, cannot easily be mobilized =0) |
| AFAVISIT | Dummy (director feels that family visits are one of the major three reasons for teacher absenteeism =1, else =0) |
| AGEPLUS | Dummy (age>11 =1, age<=11 =0) |
| AGETPAY | Dummy (director feels that travel to fetch salaries is one of the major three reasons for teacher absenteeism =1, else =0) |
| ALONE | Dummy (teacher living alone =1, living with his or her family =0) |
| ASECJOB | Dummy (director feels that teachers' second jobs are one of the major three reasons for teacher absenteeism =1, else =0) |
| ASSOC | Number of pedagogical, social or village associations the teacher is a member of |
| BACPLUS | Dummy (teacher has attained at least a high-school degree "baccalauréat" =1, else=0) |
| BASEQUIP | Dummy (basic equipment available=1, not available=0) "Basic equipment" includes: teacher's desk, usable blackboard, seats and desks for all students, white chalk, pencils and copy-books or slates for at least 75% of the students. |
| BOOKS | Share of students equipped with textbooks, average for math and French. When data were available for only one subject, the share in this subject was used as a proxy for the overall share. |
| C | Constant |
| CHANGE | Dummy (teacher would like to change the school =1, would like to remain in the same school =0) |
| CI | Country dummy for Côte d'Ivoire |
| CM | Country dummy for Cameroon |
| DIPLPED | Dummy (teacher holds a pedagogical diploma =1, doesn't hold any =0) |
| DOUBLESIFT | Dummy (several classes using the same room at different times of the day=1, else=0) |
| EDUCATION | (0,1,...,6) Teacher's educational attainment (below 6 th grade=0, 6 th or 7 th grad=1, 8 th or 9 th grade=2, 10 th or 11 th grade=3, baccalauréat=4, bac. + 1 or 2 years of tertiary education=5, 3 years or more of tertiary education=6) |
| ELECTR | Dummy (electricity available in class = 1, else = 0) |
| EXCHANGE | Dummy (teacher often (or very often) asks his colleagues for advice=1, else=0) |
| EXPER | Number of years of teaching experience |
| EXPER2 | EXPER squared |
| FRENCH_S | Dummy (French spoken at home=1, not spoken=0) |
| FRENCH | Dummy (teacher always or often speaking French outside classes=1, else=0) |
| GENDER | Dummy (male teacher=1, female teacher=0) |
| GUIDE | (0,1,2) Teacher's manual for math and French available=2, for one subject=1, for none of the two=0 |
| IADVICE | Dummy (visit of the inspector since the beginning of the year to give advice =1, else =0) |
| IINSPECT | Dummy (visit of the inspector since the beginning of the year to do an inspection =1, else =0) |
| IMEETPAR | Dummy (visit of the inspector since the beginning of the year to meet students' parents =1, else =0) |
| INSPECT | Dummy (visit of the inspector since the beginning of the year=1, else=0) |
| INTERIMDIR | Dummy (teacher has the status of an interim director =1, else =0) |

| | |
|-----------|---|
| JOBSATIS | Dummy (teacher would again choose the same profession=1, would not=0) |
| LANGLOC | Dummy (teacher speaks local language=1, does not speak=0) |
| LIBRARY | Dummy (student can use books at home=1, can't use=0) |
| LIT_P | (0,1,2) Both parents literate=2, mother or father literate=1, both illiterate=0 |
| MD | Country dummy for Madagascar |
| MEALS | (3,2,1,0) Regular breakfast, lunch and dinner=3, only two regular meals=2, only one=1, none=0 |
| MEDIA | (0,1,2) Availability at home of: radio and television=2, radio or television=1, neither of the two=0 |
| MEET | (0,1,2,3,4) Director holds a meeting with all teachers at least once a week=4, once a month=3, once per trimester=2, once a year=1, never=0 |
| MULTGRAD | Dummy (students of several grades together in one class=1, else=0) |
| NOSEM | Dummy (teacher attended no training course within the last five years=1, else =0), only for teachers with at least 3 years of job experience |
| PILOTPRG | Dummy (school participates in a special program=1, else=0). This special program can be a pilot program, an exchange program with another (foreign) school, an NGO financed project etc. |
| PTORGA | Sum of activity level of different types of school committees and associations, e.g. parent-teacher organizations (for each: very active=1, active=0.5, slightly active=0.1, not active at all=0) |
| RATE1 | Average student's share of correct answers in the pre-test (average for math and French), for all countries but Senegal (average for all students tested in a particular class) |
| RATE1_S | Individual student's share of correct answers in the pre-test (average for math and French), for all countries but Senegal |
| RATE2_S | Individual student's share of correct answers in the post-test (average for math and French), for all countries |
| RATESN1 | Average student's share of correct answers in the pre-test (average for math and French), for Senegal (average for all students tested in a particular class) |
| RATESN1_S | Individual student's share of correct answers in the pre-test (average for math and French), for Senegal |
| REPEAT2 | Number of grades repeated before the 5 th grade |
| SN | Country dummy for Senegal |
| STUDNUMB | Average number of students attending classes |
| STUDNUMB2 | STUDNUMB squared |
| TOWN | Dummy (urban school=1, rural school=0) |
| TOWNFAR | Dummy (closest town more than 2 hours away by fastest available means of transportation =1, next city at a closer distance=0) |
| TRAINING | Number of training courses followed per year during the last five years |
| TUITION | Dummy (teacher gives private tuition=1, does not=0) |
| UNION | Dummy (teacher is union member=1, non member=0) |
| VOLUNT | Dummy (teacher is not a civil servant=1, civil servant=0) |